

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of:)	
)	
Use of Spectrum Bands Above 24 GHz For)	GN Docket No. 14-177
Mobile Radio Services)	
)	
Establishing a More Flexible Framework to)	IB Docket No. 15-256
Facilitate Satellite Operations in the)	
27.5-28.35 GHz and 37.5-40 GHz Bands)	
)	
Petition for Rulemaking of the Fixed Wireless)	RM-11664
Communications Coalition to Create Service Rules)	
for the 42-43.5 GHz Band)	
)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90,)	WT Docket No. 10-112
95, and 101 to Establish Uniform License)	
Renewal, Discontinuance of Operation, and)	
Geographic Partitioning and Spectrum)	
Disaggregation Rules and Policies for Certain)	
Wireless Radio Services)	
)	
Allocation and Designation of Spectrum for)	IB Docket No. 97-95
Fixed-Satellite Services in the 37.5-38.5 GHz,)	
40.5-41.5 GHz and 48.2-50.2 GHz Frequency)	
Bands; Allocation of Spectrum to Upgrade Fixed)	
and Mobile Allocations in the 40.5-42.5 GHz)	
Frequency Band; Allocation of Spectrum in the)	
46.9-47.0 GHz Frequency Band for Wireless)	
Services; and Allocation of Spectrum in the)	
37.0-38.0 GHz and 40.0-40.5 GHz for)	
Government Operations)	

COMMENTS OF ECHODYNE CORP.

Echodyne Corp. (“Echodyne”) hereby responds to the above-captioned Further Notice of Proposed Rulemaking (“Further NPRM”) that proposes to make certain spectrum bands above 24 GHz available for mobile and other terrestrial-based services.¹ In considering the proposals

¹ See Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, GN Docket No. 14-177, *Report and Order and Further Notice of Proposed Rulemaking*, 31 FCC Rcd 8014 (2016) (“Further NPRM”).

contained in the Further NPRM, Echodyne again asks that the Commission avoid actions that could hinder the ongoing development of innovative radar technology near 24 GHz and 32 GHz. More specifically, the Commission should refrain from promoting introduction of new terrestrial “5G” services in frequency bands currently allocated to radionavigation services unless compatibility and non-interference assignment criteria are implemented.

I. BACKGROUND

Echodyne is a technology startup based in the Seattle, Washington area developing and bringing to market innovative metamaterial-based radar technology. Echodyne’s technology offers disruptive capabilities for existing radar applications, and enables new categories of radars never before thought possible such as small, lightweight radars for unmanned aerial systems (“UAS”). Echodyne is actively exploring new technologies, services, and applications that would leverage various radionavigation and radiolocation allocations, including radionavigation allocations in the 24 GHz and 32 GHz bands that are, in part, the subject of this proceeding.²

In January of 2016, Echodyne submitted comments in this proceeding that responded to the Commission’s previously released Notice of Proposed Rulemaking.³ Echodyne stated that its technology designs have centered on frequency bands available for radionavigation at 24.45-24.65 GHz and the 32.3-33.4 GHz.⁴ Echodyne noted that while the NPRM did not specifically propose any new mobile operations in the bands currently being developed by Echodyne, it did seek comment on circumstances under which adjacent band spectrum might be used for future

² See *id.*

³ Comments of Echodyne Corp., GN Docket No. 14-177, submitted January 28, 2016, (“Echodyne NPRM Comments”); Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, GN Docket No. 14-177, *Notice of Proposed Rulemaking*, 30 FCC Rcd 11878 (2015) (“NPRM”).

⁴ Echodyne NPRM Comments at 4.

mobile operations.⁵ Echodyne acknowledged the need for the Commission to identify frequency bands for the innovation of new services, but asked that the Commission act cautiously in considering any actions that could hinder development of radar technologies in the 24 GHz and 32 GHz frequency bands.⁶

With respect to the 24 GHz and 32 GHz allocations, the Further NPRM expands on the discussion first raised in the NPRM. Specifically, the Further NPRM proposes to authorize flexible use licenses that would permit fixed and mobile services in several bands above 24 GHz including the 24.25-24.45 GHz, 24.75-25.25 GHz bands and 31.8-33.4 GHz bands.⁷ In so doing, the Further NPRM does not raise any issues or concerns related to the use of the 24.45-24.65 GHz band for radionavigation radar applications but does acknowledge that “there are still two major challenges to authorizing mobile operations in the 32 GHz band: (1) protecting radionavigation operations in the 32 GHz band; and (2) protecting radio astronomy observations in the adjacent 31.3-31.8 GHz band.”⁸ The Further NPRM requests commenters to provide specific information on existing and planned non-Federal uses of radar in the 32 GHz band.⁹

II. DISCUSSION

Since filing comments on the NPRM earlier this year, Echodyne has continued to develop and test prototype radar technologies under FCC experimental authority in the 24.45-24.65 GHz band, including development and testing of detect and avoid (“DAA”) radar for small UAS. Operating at several locations around the country, Echodyne has been testing airborne and fixed radar devices operating at varying bandwidths and power levels. These tests have exceeded

⁵ *Id.*

⁶ *Id.* at 4-5.

⁷ Further NPRM ¶ 373.

⁸ *Id.* ¶ 390.

⁹ *Id.* ¶ 392.

expectations in demonstrating the commercial viability of Echodyne's technology without revealing any incompatibilities with other spectrum users. Echodyne's next step in product development is to work with the FAA's Spectrum Office to agree on technical and operational specifications that would guide the final design of commercial use DAA radar devices in this band.¹⁰ When that step is completed, Echodyne intends to seek FCC equipment approval for its DAA radar in this band as soon as possible.

The proposals contained in the Further NPRM on the 24 GHz band do not directly impact the 24.45-24.65 GHz radionavigation band. As such, Echodyne does not offer any specific recommendations related to those proposals. However, the expanded use of the adjacent bands for terrestrial mobile uses could impact Echodyne's radar operations if the Commission finds adoption of stringent out-of-band emissions limits on radionavigation devices necessary to promote the reliability of advanced terrestrial services. To that end, Echodyne urges the FCC to not burden radar devices with stringent power and emissions limits that undermine the utility of the 24.45-24.65 GHz band for radionavigation devices. Rather, future terrestrial networks need to be advised of the adjacent band radionavigation operations and design networks to coexist with that environment. To this end, Echodyne recommends that the FCC consider relying on existing technical standards applicable to Federal Government radar devices to establish a baseline spectrum environment in the 24.45-24.65 GHz band.¹¹

¹⁰ While FCC Rule 87.187(x) provides that the bands 24450-24650 MHz and 32300-33400 MHz are available for airborne radionavigation devices, Section 87.131 states that the frequency, emission and maximum bandwidth requirements for airborne radionavigation devices will be determined in the equipment certification process. *See* 47 C.F.R. §§ 87.187(x); 87.131. Echodyne has designed its DAA radar to be compatible with NTIA technical standards for radar devices and is now working to confirm the validity of its assumptions with the FAA and NTIA prior to submitting its request for equipment approval.

¹¹ Echodyne has focused its initial equipment designs using relevant standards defined in NTIA's Manual of Regulations. *See, e.g.* RSEC Criteria A Emission Mask, Section 5.5.7.1, NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management,

The Further NPRM also seeks information about the compatibility of mobile use of the 32 GHz band with existing uses.¹² While Echodyne has yet to build and test devices operating in the 32 GHz band, we are working on a design for a 32 GHz radar for a future iteration of our DAA product. The 32 GHz band presents an attractive opportunity for aeronautical services because it is allocated globally for radionavigation services, and indeed it is the only global allocation for radionavigation services above 15 GHz. Although frequencies at 15 GHz and below may be suitable for airborne DAA radar for large UAS, these lower frequencies are not suitable for small UAS. Because the size of a radar increases as the frequency decreases, radars at these lower frequencies may be too large to be carried on small commercial UAS. For this reason, the 32 GHz band will be key to allowing small commercial UAS to be integrated safely into the national airspace.

Looking forward, shared use between aeronautical radionavigation services and 5G terrestrial services at 32 GHz would appear to be improbable. The FAA has forecast that there will be 52,000 high-end commercial UAS in the United States by 2020, and that this number will soar once the FAA adopts a regulatory framework for beyond visual line of sight operations.¹³ These will be small commercial UAS flying at low altitudes, making co-channel sharing with terrestrial services inherently difficult. Radar receivers need to be sensitive enough to detect a signal that has traveled from the transmitter to a target and back again, meaning even low levels of other background signals can interfere with a radar. This level of risk is intolerable for a safety

September 2015 Revision of the May 2013 Edition. Echodyne's discussions with the FAA on appropriate technical standards may identify other emissions limits that could serve this purpose as well.

¹² Further NPRM ¶ 392.

¹³ See FAA, *FAA Aerospace Forecast for Fiscal Years 2016-2036 available at* https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2016-36_FAA_Aerospace_Forecast.pdf.

related activity such as DAA. Conversely, airborne radar devices are likely to cause problems for terrestrial networks operating in the same band.

Echodyne believes that aeronautical radionavigation services should be isolated from terrestrial services. Should the Commission consider frequency separation for aeronautical and terrestrial services in the 32 GHz band, it must ensure that a sufficient quantity of spectrum is preserved for exclusive radionavigation services. When evaluating compatibility among users of this band, the Commission should be cognizant of the need to protect vital aeronautical services using technologies both in existence today and those that may be developed in the future.

III. CONCLUSION

Echodyne appreciates this opportunity to respond to the Further NPRM and discuss its operations in and adjacent to the 24 GHz and 32 GHz bands. As the Commission continues to consider making more spectrum available for mobile, Echodyne urges the Commission to ensure that its actions continue to protect radionavigation services, which will be essential to important technological developments in the near-term.

Respectfully submitted,

/s/ Andrea Radosevich

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